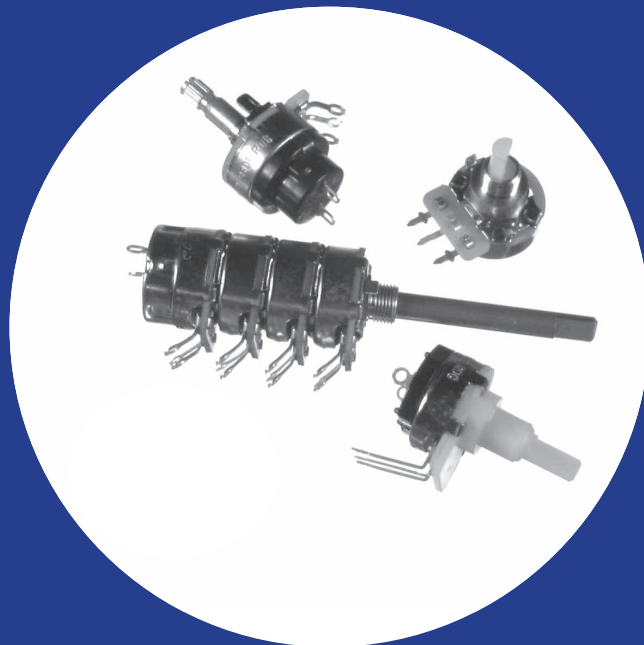


## Industrial 15/16" (24mm) Diameter 1/2 Watt Composition Variable Resistors

### Features

- Low cost
- Versatile mounting styles:
  - bushing
  - twist tab
  - bend tab
  - snap-in PC bracket
  - solder lug or PC terminals
- Wide resistance range
- Molded / metal shaft & bushing
- Pull-push, Push-push and rotary power switches
- Shaft and bushing waterseal available
- Rear extended shaft available
- Single, tandem, or concentric constructions
- Special vernier adjust (multiturn) construction available for fine adjustment
- Long life construction available



## Electrical and Mechanical Specifications

### Resistance Range

100 ohms through 10 megohms (linear taper)  
Long life construction - 10K ohms through 5 megohms (linear taper)

### Resistance Tolerance

Standard:  $\pm 20\%$   
Special:  $\pm 10\%$

### Power Rating, Watts

1/2 watt 10K ohms, 1/3 watt; above 10K ohms through 100K ohms, 1/4 watt above 100K ohms. Full rating @ 55°C, derated to no load at 85°C

### Voltage Rating

Bushing to Terminals:  
High pot test, one minute  
Standard construction – 1080VAC  
Vernier construction – 1000VAC  
Operating maximum – 750VDC  
Across End Terminals:  
500 VDC, load not to exceed listed wattage ratings.  
Special: 1500/1800VAC high pot available.

### Resistance Tapers

Standard – Linear, 10% Audio and 10% CCW Audio  
Special – Consult CTS

### Rotational Angle

#### Standard Construction

Total Rotation: with rotary switch —  $320^\circ \pm 5^\circ$   
Total Rotation: without switch or with push-pull or push-push switches —  $300^\circ \pm 5^\circ$

#### Vernier Adjust Construction

Shaft Rotational Angle  
VA-450 –  $3700^\circ - 10 \frac{1}{4}$  turns  
5VA-450 –  $2000^\circ - 5 \frac{1}{2}$  turns

### Effective Rotation

With or without switch —  $300^\circ$  (approximate)  
Special angle available — consult CTS

### Bushing Information

Diameter: EIA Standard  $\frac{3}{8}$ "-32 UNEF-2A thread.  
Standard length:  $\frac{3}{8}$ " or  $\frac{1}{4}$ " (9.53mm or 6.35mm)  
Special length available upon request  
Metric bushing available upon request

### RoHS Compliant

All models of 450 series pot. are now RoHS compliant except 040 and 041 push-push power switches. The two models of power switches are RoHS compliant available upon request.

(continued on next page)

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## Electrical and Mechanical Specifications (continued)

### Locating Lugs (Bushing Mounted Style)

Standard Position : Left side with terminals facing inward  
Available : No lug, right lug or two lugs with terminals facing inward

### Shaft Information

Metal Shafts : Aluminum standard

Length : Standard — Up to 3" in 1/8" increments.  
Special — Consult CTS

Diameter : Standard — .250" (6.35mm)  
Special — Consult CTS

Molded Shafts —

Length : Standard — Round, Flatted & knurled shafts available up to 1 1/2" (38.1mm) in 1/8" (3.2mm) increments  
Special — Some molded shaft designs available up to 2" (50.8mm). Consult CTS

Diameter : Diameter over knurl —  
.240" – .246" (6.10mm – 6.25mm)

Color : Colors are available.

### Metal Tubing Shafts —

Length : Standard — Up to 3" (76.2mm)  
Special — Consult CTS

Outside Diameter :

Rear Extended Shafts — .265" (6.73mm) or .250" (6.35mm)  
Metal or molded rear extended shafts available.

### Typical Constructions

The following is basic information on the most common CTS 15/16" (24mm) diameter composition variable resistor constructions supplied to our customers. Space limitations prohibit showing the virtually thousands of additional constructions fabricated to exacting customer specifications. For your special applications the CTS engineering staff is at your disposal for designing the best and most economical construction to meet your requirements.

### Vernier Constructions

This construction is designed for fine tuning applications. It provides precision adjustments in 3700° (10 1/4 turns) or 2000° (5 1/2 turns)

### Long Life Construction

This construction provides an extended life of 250,000 cycles (with a limited rotation angle) and is available with resistance ranging from 10K ohms to 5 megohms, linear taper only. Consult CTS for other tapers.

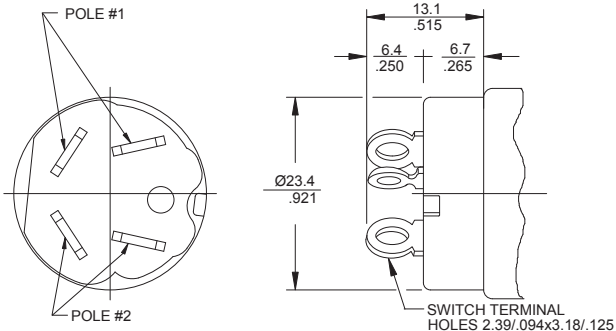
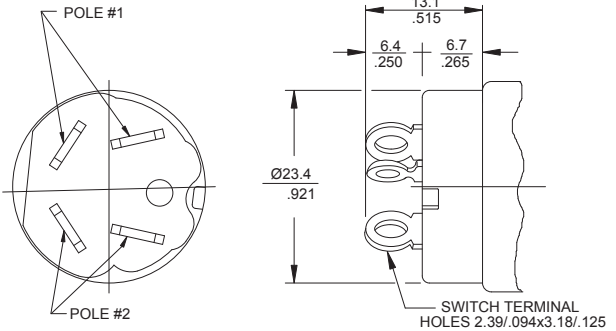
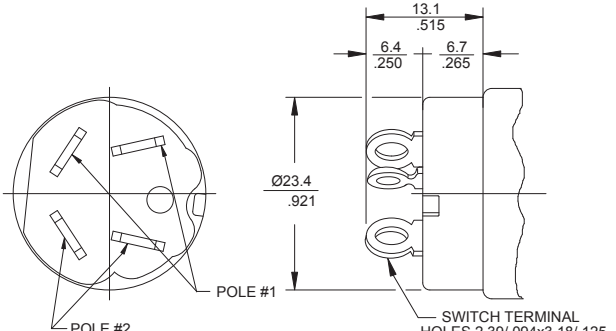
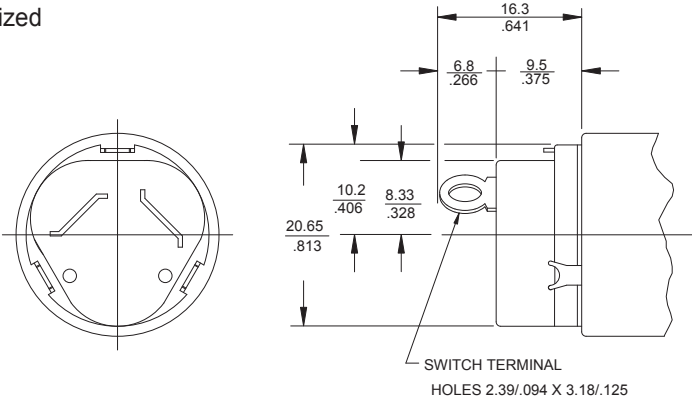
# POWER SWITCHES

Series	Contact Arrangement	Electrical Rating	Outline Drawing
FR-GC	SPST Rotary	3 amps @ 125 volts, 1 amp @ 250 volts AC UL Recognized	<p>SWITCH TERMINAL HOLES 2.39/.094x3.18/.125</p>
GC	SPST Rotary	5 amps @ 20 volts DC (Automotive)	
Actuating angle – 20° Actuating Torque – 7 to 17 in. oz. (504 to 1225 gf-cm)			
DIMENSION: $\frac{\text{mm}}{\text{inch}}$			
TGC	SPST Rotary	6 amps @ 125 volts AC UL & CSA Recognized	<p>SWITCH TERMINAL HOLES 2.39/.094x3.18/.125</p>
Actuating angle – 20° Actuating Torque – 7 to 17 in. oz. (504 to 1225 gf-cm)			
DIMENSION: $\frac{\text{mm}}{\text{inch}}$			
TV-023	SPST Rotary	TV-5 rating UL & CSA Recognized	<p>SWITCH TERMINAL HOLES 2.39/.094x3.18/.125</p>
Actuating angle – 20° Actuating Torque – 10 to 20 in. oz. (720 to 1441 gf-cm)			
DIMENSION: $\frac{\text{mm}}{\text{inch}}$			

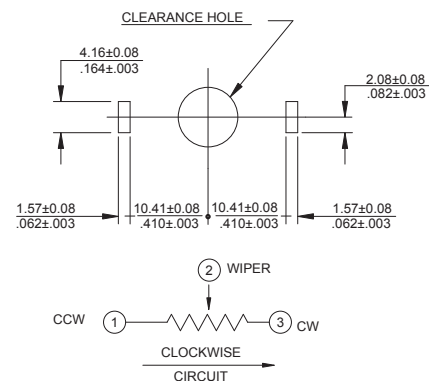
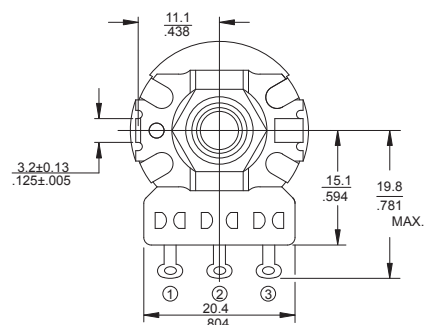
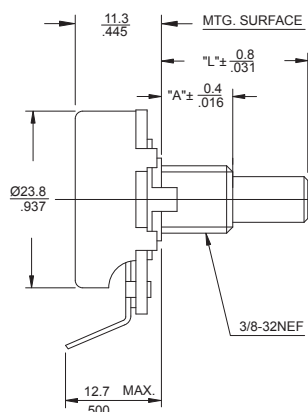
# POWER SWITCHES

Series	Contact Arrangement	Electrical Rating	Outline Drawing
<b>040</b>  Pretravel 13/64"(5.2mm) Activating Force -2 to 5 lb (0.9 to 2.3 kgf)	<b>SPST</b> Push-on Push-off	6 amps @ 125 volts AC	<p>             DIMENSION: <math>\frac{\text{mm}}{\text{inch}}</math> </p>
<b>041</b>  Pretravel 13/64"(5.2mm) Activating Force -2 to 5 lb (0.9 to 2.3 kgf)	<b>SPDT</b> Push-on Push-off	6 amps @ 125 volts AC	<p>             DIMENSION: <math>\frac{\text{mm}}{\text{inch}}</math> </p>
<b>050</b>  Actuating angle – 25° Actuating Torque – 2 to 15 in. oz. (144 to 1080 gf-cm)	<b>SPST</b> Rotary	3 amps @ 125 volts AC (Shallow construction switch) UL & CSA Recognized 7 1/2 amps @ 20 volts DC (Automotive)	<p>             DIMENSION: <math>\frac{\text{mm}}{\text{inch}}</math> </p>
<b>FR-027</b>  Actuating angle – 20° Actuating Torque – 10 to 20 in. oz. (720 to 1441 gf-cm)	<b>DPST</b> Rotary	3 amps @ 125 volts, 1 amp @ 250 volts AC UL Recognized	<p>             DIMENSION: <math>\frac{\text{mm}}{\text{inch}}</math> </p>

# POWER SWITCHES

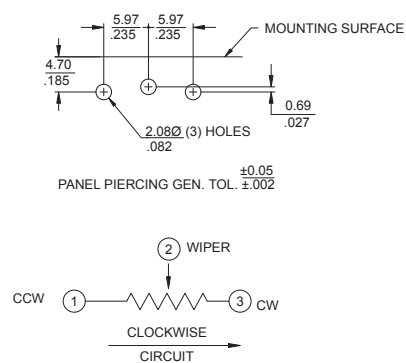
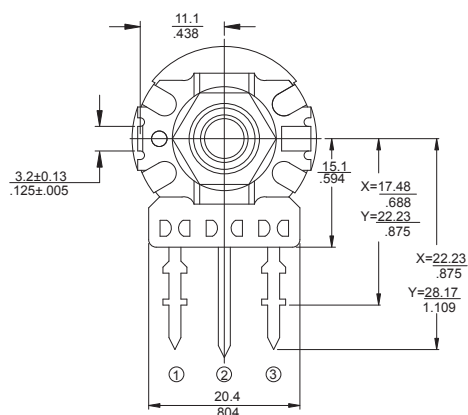
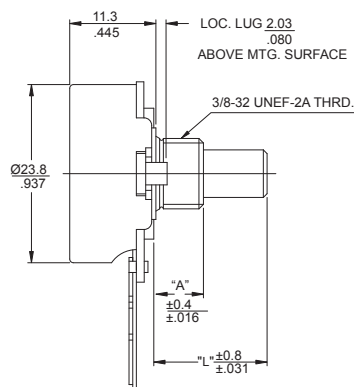
Series	Contact Arrangement	Electrical Rating	Outline Drawing	
<b>TV-020</b>	<b>DPST</b> Rotary	125 volts AC Pole #1, TV-1 rating Pole #2, TV-3 rating UL & CSA Recognized		
Actuating angle – 20° Actuating Torque – 10 to 18 in. oz. (720 to 1297 gf-cm)				
DIMENSION: $\frac{\text{mm}}{\text{inch}}$				
<b>FR-028</b>	<b>SPDT</b> Rotary	3 amps @ 125 volts AC UL Recognized		
Actuating angle – 20° Actuating Torque – 10 to 20 in. oz. (720 to 1441 gf-cm)				
DIMENSION: $\frac{\text{mm}}{\text{inch}}$				
<b>TV-021</b>	<b>SPDT</b> Rotary	TV-4 rating UL Recognized		
Actuating angle – 20° Actuating Torque – 10 to 18 in. oz. (720 to 1297 gf-cm)				
DIMENSION: $\frac{\text{mm}}{\text{inch}}$				
<b>FR-K</b>	<b>SPST</b> Pull-on Push-off	3 amps @ 125 volts AC UL & CSA Recognized		
Pretravel - 5/32" (3.97mm) Actuating force - 7 to 16 oz. - Single section control (200 to 1000 gf) 7 to 20 oz. - Tandem control (200 to 1250 gf)				
DIMENSION: $\frac{\text{mm}}{\text{inch}}$				

## T450 Metal Shaft, Bushing Mounting, Type "T" Solder Lug Terminals



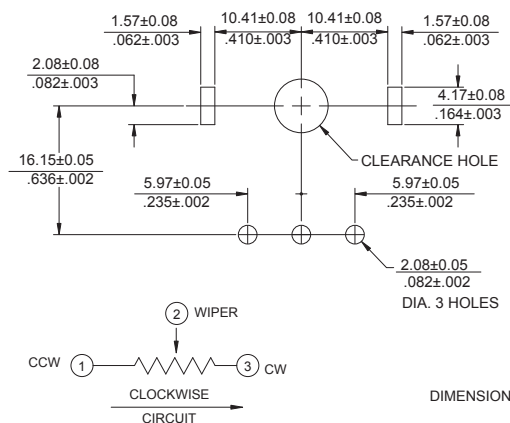
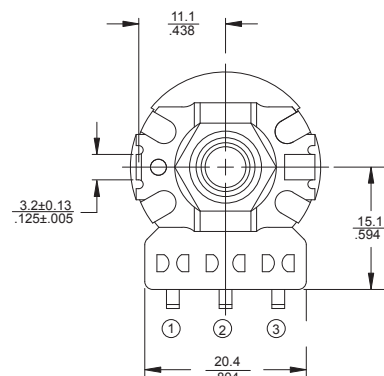
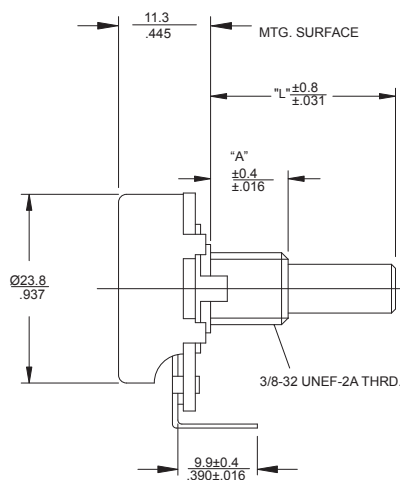
DIMENSION:  $\frac{\text{mm}}{\text{inch}}$

## X450 / Y450 Metal Shaft, Bushing Mounting, Printed Circuit Type "X" Or "Y" Terminals



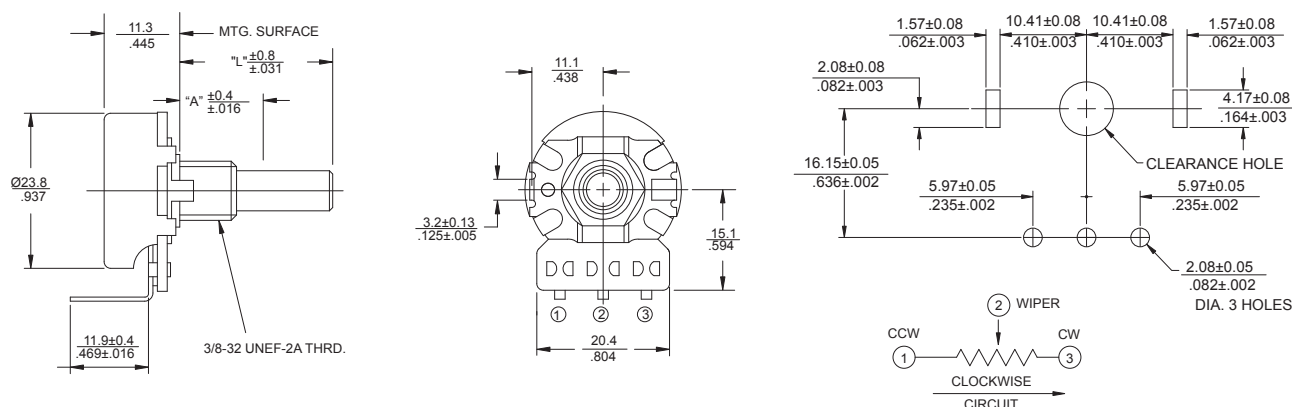
DIMENSION:  $\frac{\text{mm}}{\text{inch}}$

## U450 Metal Shaft, Bushing Mounting, Printed Circuit Type "U" Terminals



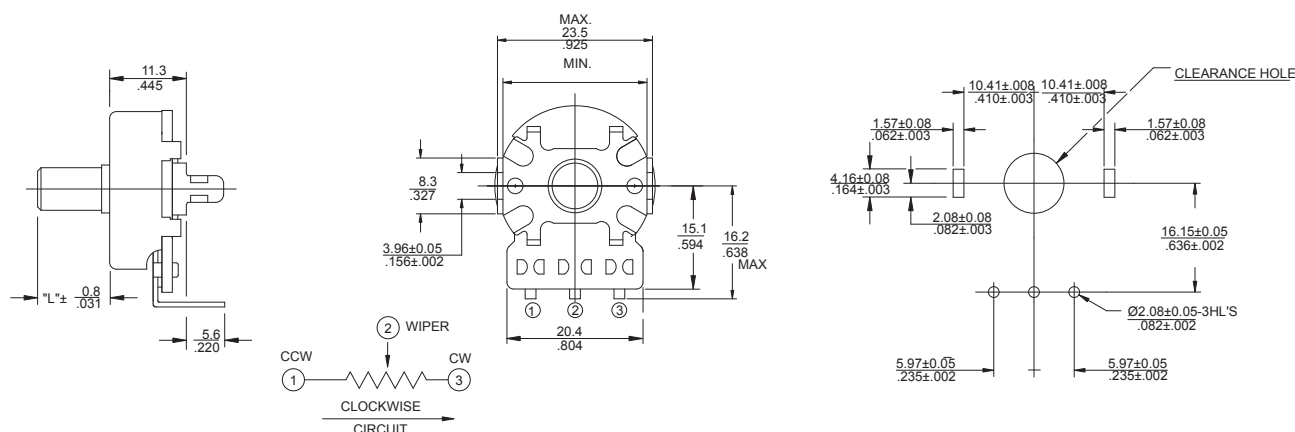
DIMENSION:  $\frac{\text{mm}}{\text{inch}}$

## V450 Metal Shaft, Busing Mounting, Printed Circuit Type "V" Terminals



DIMENSION:  $\frac{\text{mm}}{\text{inch}}$

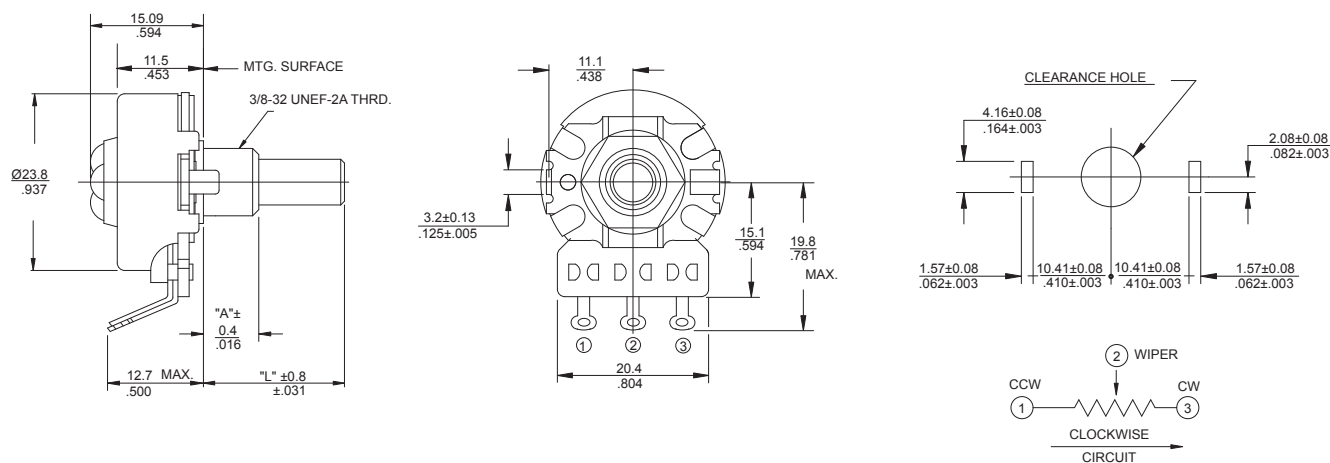
## UPE450RE Rear Extended Metal Shaft, Twist Tab Mounting, Printed Circuit Type "U" Terminals



DIMENSION:  $\frac{\text{mm}}{\text{inch}}$

\* Consult CTS for details

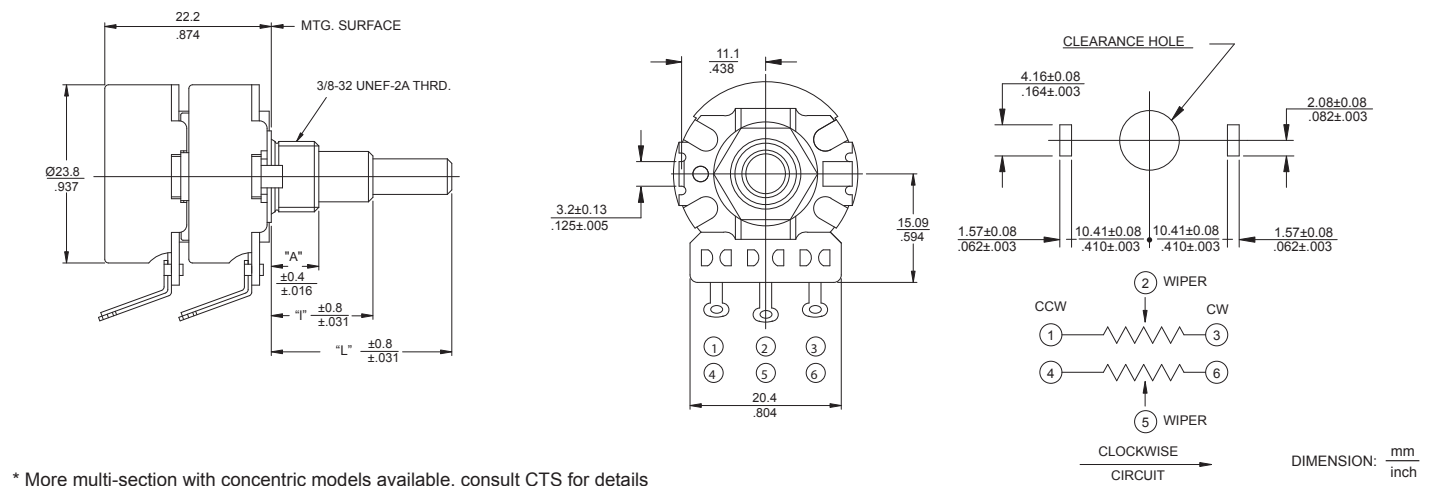
## VA-T450 & 5VA-T450 Metal Shaft, Bushing Mounting, Type "T" Solder Lug Terminals, Vernier Adjust



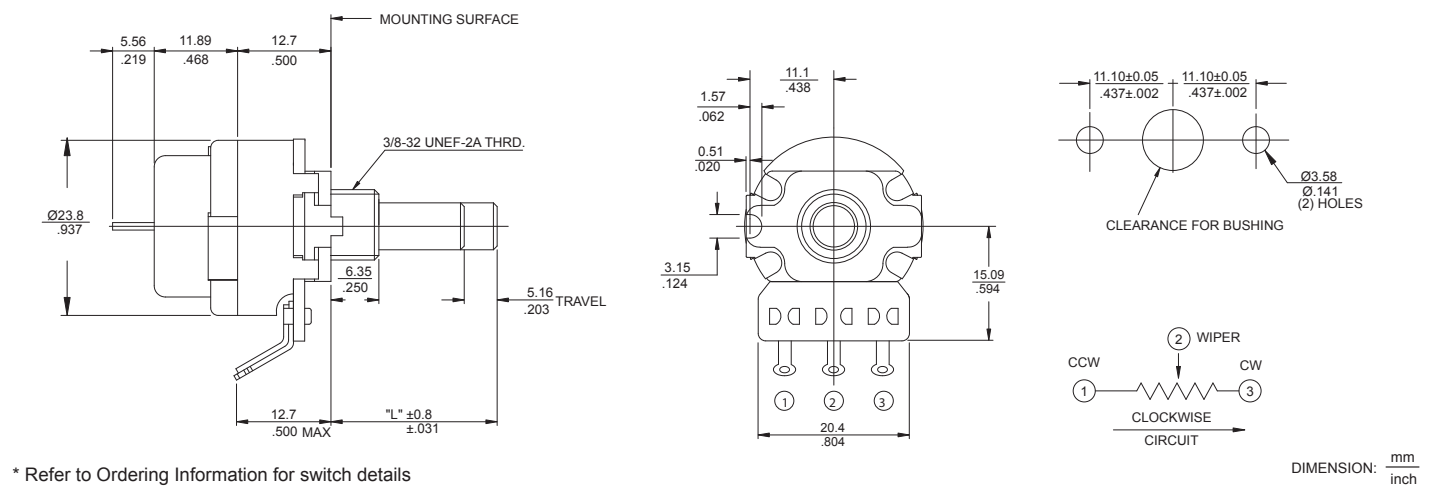
DIMENSION:  $\frac{\text{mm}}{\text{inch}}$

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**TC2-450** Dual-section, Concentric Metal Shafts, Bushing Mounting, Type “T” Solder Lug Terminals



**040-TMG450** Metal Shaft, Bushing Mounting with Insulated Plate, Type "T" Solder Lug Terminals, 040 Switch



8 - 9

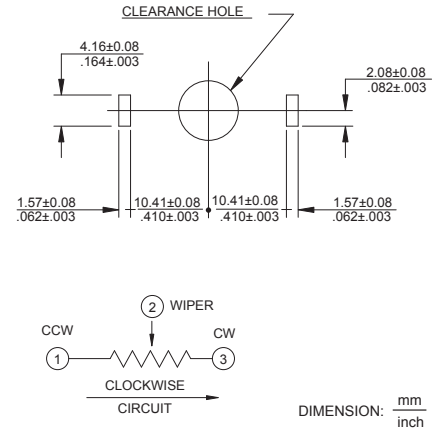
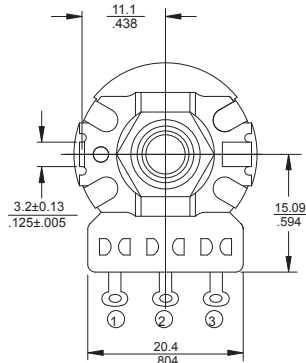
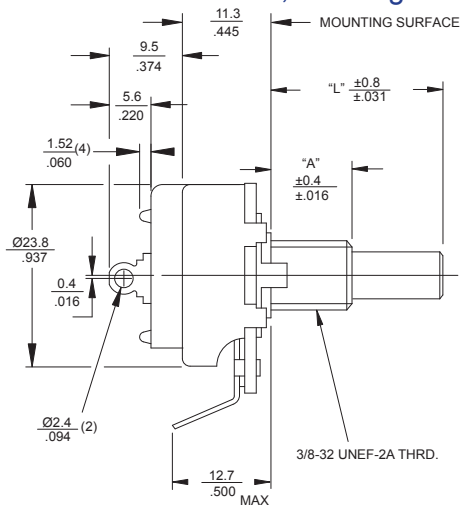
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CTS Electronic Components



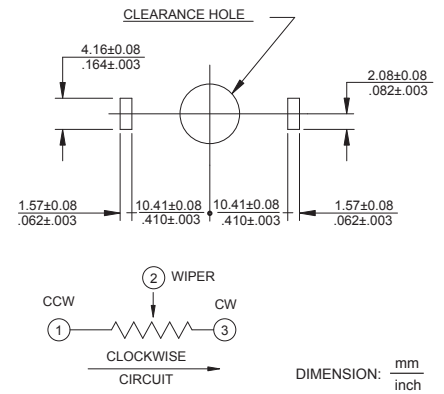
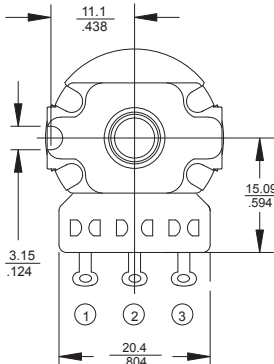
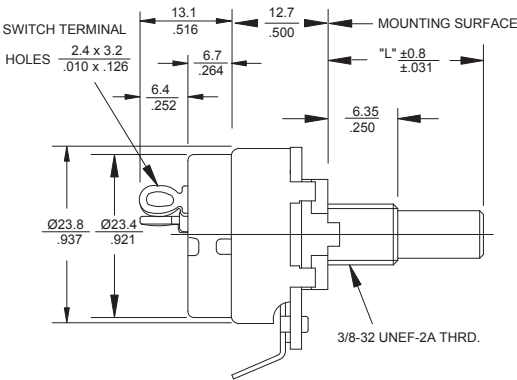
050-T450 Metal Shaft, Bushing Mounting, Solder Lug terminals, 050 Switch

\* Refer to Ordering Information for switch details



TGC-TMG450 Metal Shaft, Bushing Mounting with Insulated Plate, Type "T" Solder Lug Terminals, TGC Switch

\* Refer to Ordering Information for switch details



Ordering Information

450

TERMINAL STYLE

T – SOLDER LUG  
X – PC(.688"(17.5mm) HEIGHT)  
Y – PC(.875"(22.2mm) HEIGHT)  
U – FORMED TO FRONT  
V – FORMED TO REAR

T

MOUNTING STYLE "A"

BUSHING LENGTH: 1/8" (3.2mm) INCREMENTS  
EXAMPLES:  
1 – TWIST TAB MOUNT  
2 – .250" (6.35mm)  
3 – .375" (9.53mm)  
8 – 1.000" (25.4mm)  
A – .250" (6.35mm) DIECAST  
B – .375" (9.53mm) DIECAST  
M – .250" (6.35mm) MOLDED

2

SHAFT LENGTH "L"

FROM MOUNTING SURFACE 1/32" (0.8mm) INCREMENTS  
METAL SHAFT EXAMPLES:  
20 – .625" (15.9mm)  
24 – .750" (19.1mm)  
28 – .875" (22.2mm)  
32 – 1.000" (25.4mm)  
  
\* MOLDED SHAFT  
M1 – .500" (12.7mm)  
M2 – .625" (15.9mm)  
M3 – .750" (19.1mm)  
M4 – .875" (22.2mm)  
M5 – 1.000" (25.4mm)  
  
\* 0.014" shaft length reduced when molded mounting style applied  
\* Available for non switch and rotary switch models

20

RESISTANCE CODE EXAMPLES

CODE	RESISTANCE
501	500 OHMS
102	1K
252	2.5K
502	5K
103	10K
253	25K
503	50K
104	100K

R

SHAFT TRIM

R – ROUND  
F – FLATTED .375" X .156" (9.5mm X 4.0mm)  
K – KNURLED METAL SHAFT (.236"(6.0mm) DIA OVER KNURL 24 TEETH)  
MOLDED SHAFT (.240"-.246" Dia over knurl 24 teeth)  
S – SD SLOT .063" DEEP X .047" WIDE (1.6mm X 1.2mm)

103

TAPER

1 – LINEAR  
2 – 10% AUD  
3 – 10% CCW AUD

RESIST TOL

A – ±10%  
B – ±20%

B

SPECIALS

1 – LEFT SIDE LUG \*  
4 – RIGHT SIDE LUG \*  
5 – NO LOCATING LUG  
6 – BOTH SIDE LUG  
  
\* AVAILABLE FOR MOLDED MOUNTING BUSHING

1

SWITCHES

FUNCTION	CTS TYPE
A – NONE	
B – SPST	ROTARY 050
C – SPST	ROTARY TGC
D – DPST	ROTARY 027
E – SPDT	ROTARY 028
F – SPST	PULL-PUSH FRK
G – SPST	PUSH-PUSH 040
H – SPDT	PUSH-PUSH 041
J – SPST	ROTARY FR-GC
K – NONE	VERNIER ADJUST 10 1/4 turns
L – NONE	VERNIER ADJUST 5 1/2 turns

A

1